

**What Is Claimed Is:**

- 5 1. An isolated polypeptide having  $\beta,\beta$ -carotene 15,15'-dioxygenase activity comprising SEQ ID NO: 1 or a polypeptide having  $\beta,\beta$ -carotene 15,15'-dioxygenase activity and being at least 60% homologous to SEQ ID NO: 1 as determined by the Wisconsin Sequence Analysis Package GCG, Version 9.1 (1997).
- 10 2. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 70% homologous to SEQ ID NO: 1.
- 15 3. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 80% homologous to SEQ ID NO: 1.
4. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 90% homologous to SEQ ID NO: 1.
- 20 5. An isolated polypeptide according to claim 1 which is derived from chicken.
6. An isolated nucleic acid sequence encoding the polypeptide of claim 1.
7. An isolated nucleic acid sequence according to claim 6 which comprises SEQ ID NO: 2 or a fragment thereof.
- 25 8. An isolated nucleic acid sequence according to claim 7 wherein the fragment has at least 20 bases.
- 30 9. An isolated nucleic acid sequence according to claim 7 wherein the fragment has at least 30 bases.

10. An isolated nucleic acid sequence according to claim 6 wherein the nucleic acid is a deoxyribonucleic acid.

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5 11. An isolated nucleic acid sequence according to claim 6 wherein the nucleic acid is an antisense ribonucleic acid.

12. A primer for amplifying a gene coding for a polypeptide having  $\beta,\beta$ -carotene 15,15'-dioxygenase activity which primer comprises a fragment of the nucleic acid sequence according to claim 6.

10 13. A probe for detecting a gene coding for a polypeptide having  $\beta,\beta$ -carotene 15,15'-dioxygenase activity which probe comprises a fragment of the nucleic acid sequence according to claim 6.

15 14. A test kit for amplifying and/or detecting a gene or a fragment thereof coding for  $\beta,\beta$ -carotene 15,15'-dioxygenase wherein the test kit comprises at least one primer according to claim 12.

20 15. A test kit for amplifying and/or detecting a gene or a fragment thereof coding for  $\beta,\beta$ -carotene 15,15'-dioxygenase wherein the test kit comprises at least one probe according to claim 13.

16. An antibody which specifically reacts with a polypeptide according to claim 1.

25 17. An immunoassay for the detection and/or quantification of  $\beta,\beta$ -carotene 15,15'-dioxygenase which comprises at least one antibody according to claim 16.

30 18. A process for the production of vitamin A comprising enzymatically cleaving  $\beta$ -carotene with a polypeptide according to claim 1.

ent 19. A method for introducing a  $\beta,\beta$ -carotene 15,15'-dioxygenase cDNA into a host cell comprising introducing a cDNA coding for the polypeptide of claim 1 into a vector suitable for the host cell and introducing the vector into the host cell.

5 20. A method according to claim 19 wherein the host cell is a plant cell.

21. A method according to claim 19 wherein the host cell is a prokaryotic cell.

22. A method according to claim 19 wherein the host cell is a yeast cell or a fungal cell.

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23. A method according to claim 19 wherein the host cell is an alga cell.

24. A method according to claim 19 wherein the host cell is a mammalian cell.

15 25. A method according to claim 24 wherein the mammalian cell is a human cell.

26. A host cell obtained by the method of claim 19.

ent 27. A host cell according to claim 26 which comprises a  $\beta,\beta$ -carotene 15,15'-dioxygenase cDNA obtained from another species.

Rule 126 28 27. An isolated polynucleotide which encodes  $\beta,\beta$ -carotene 15,15'-dioxygenase comprising SEQ ID NO: 2.

29 28 25 28. An isolated polynucleotide according to claim 27 which consists essentially of SEQ ID NO: 2.

30 29 28. An isolated polynucleotide according to claim 27 which consists of SEQ ID NO: 2.

31 30 30. A vector comprising the polynucleotide of SEQ ID NO: 2.

Rule 124  
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31. A host cell transformed with the vector of claim ~~30~~ 31

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32. An isolated polypeptide having  $\beta,\beta$ -carotene 15,15'-dioxygenase activity  
5 comprising SEQ ID Nos: 1 or 4.

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33. A primer set for amplifying a polynucleotide encoding  $\beta,\beta$ -carotene 15,15'-dioxygenase comprising SEQ ID NO: 8 as a 5' primer and SEQ ID NO: 9 as a 3' primer.

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34. A primer set for amplifying a polynucleotide encoding  $\beta,\beta$ -carotene 15,15'-dioxygenase comprising a polyT/Not reverse primer and SEQ ID NO:10 as a forward primer.

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35. A kit for amplifying and/or detecting a polypeptide or fragment thereof encoding  $\beta,\beta$ -carotene 15,15'-dioxygenase comprising at least one primer selected from the group consisting of SEQ ID Nos: 8, 9, and 10.